Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Combined vortex-induced vibration of a rigid cylinder and a detached flexible splitter-plate CHARU MITTAL, ATUL SHARMA, Indian Institute of Technology Bombay — A 2D numerical study on vortex induced vibration (VIV) of a rigid cylinder and a flexible splitter-plate is presented, using our immersed interface method based in-house code. In the present work, the effect of cylinder-plate spacing S* (=0.51-3) and the reduced velocity U* (=1-12.5), on the periodic flow-structures and the energy harvesting potential, is studied at constant Reynolds number Re=100, cylinder mass ratio M*=1, and damping coefficient ζ =0.005. The transverse vibrations of the cylinder are significantly enhanced at larger U* for smaller S*. The enhanced oscillations at larger U* resulted in a novel vortex shedding pattern, comprising of pairs of cylinder and plate vortices, as compared to 2S pattern for the vibration of only rigid cylinder at smaller Re. The vortex pattern at low and intermediate U* continue to remain the same as that obtained without the plate; 2S and C(2S) respectively. The interaction of the plate and the cylinder vortices leads to plate tip-displacement enhancement at smaller S* and intermediate U*. The overall cylinder-plate response indicates maximum energy harvesting potential at high U* and low S*. The present work is the first study on the combined VIV and presents a promising system for energy harvesting.

Charu Mittal
Indian Institute of Technology Bombay

Date submitted: 01 Aug 2019 Electronic form version 1.4